

**Site YF3**  
**Petroleum Site Characterization**

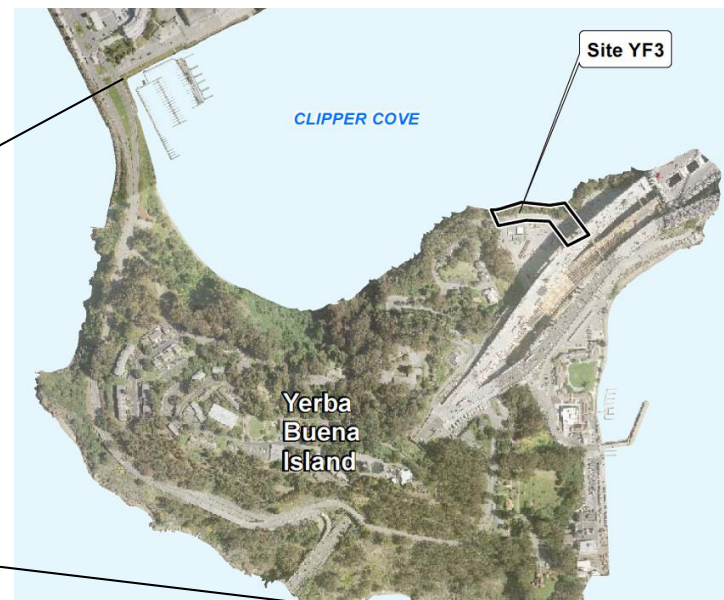
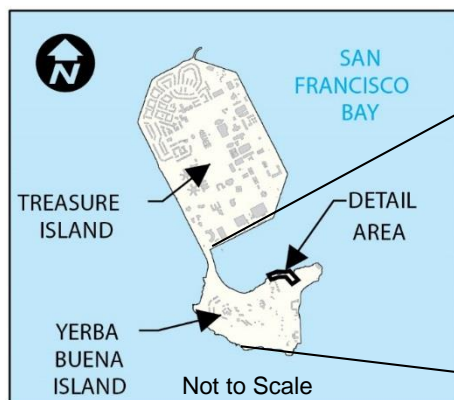
**FORMER NAVAL STATION TREASURE ISLAND**  
**SAN FRANCISCO, CALIFORNIA**

**BCT Meeting**  
**May 20, 2015**

# Presentation Overview



- Site YF3 Orientation
- Previous Investigations and Assessments
- Approach to Further Characterization
- Low Threat Closure Criteria for Site YF3
- Comparison of Site Data With Low Threat Closure Policy
- Field Investigation Challenges
- Path Forward
- Discussion



# Site YF3 Orientation



**View of Site Facing South/Southwest**

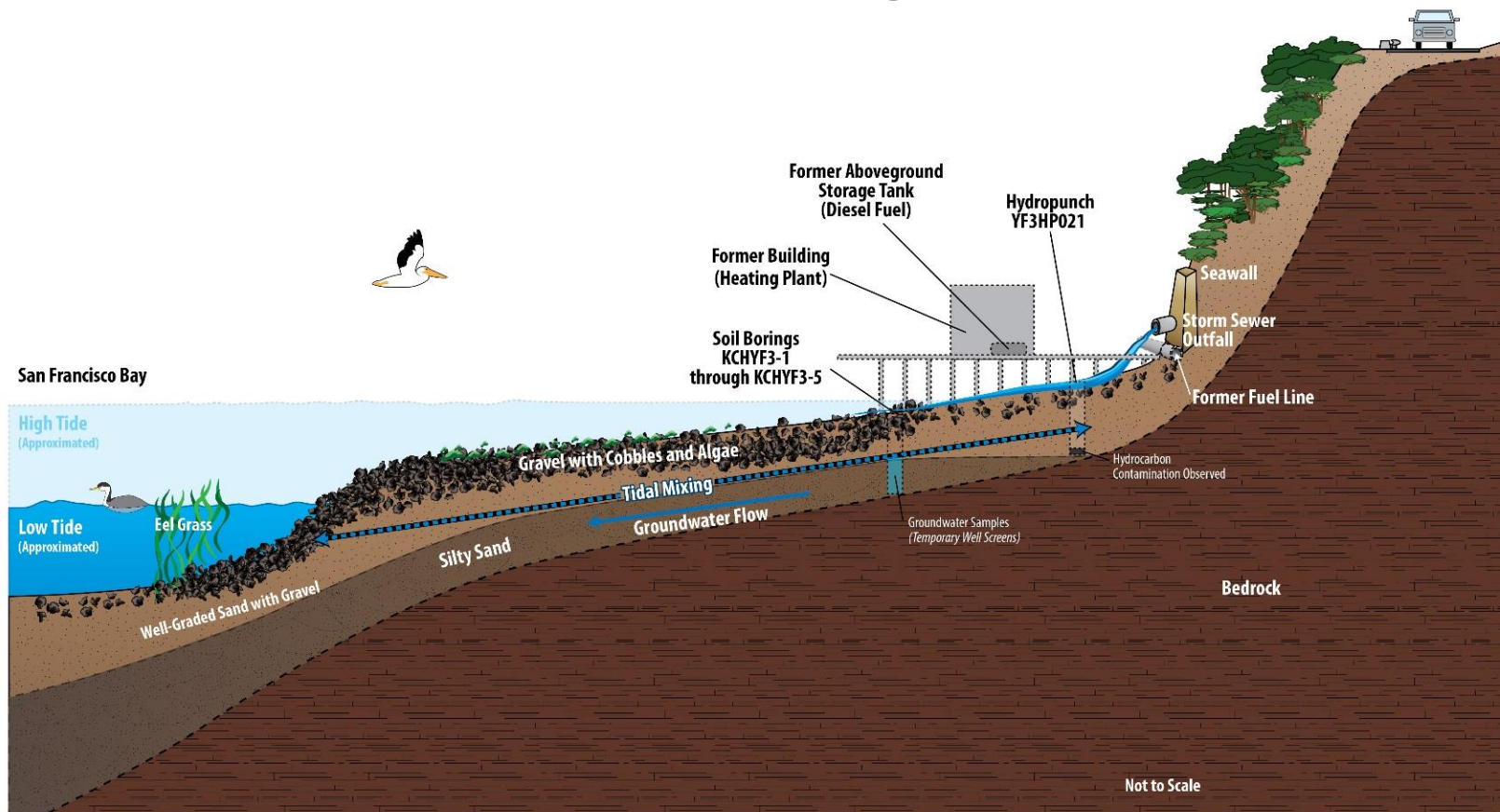


**Eastern Edge of Site (Facing East)**

# Conceptual Site Model (2D graphic overview)



- Former AST and fuel lines (removed/abandoned in place) are suspected source of diesel release
- Area of contamination lies within tidal mixing zone





# Previous Investigations and Assessments



- **Corrective Action Plan for Inactive Fuel Lines (2003)**
  - Recommended additional sampling to better define nature and extent of contamination
- **Field Activities Report (2013)**
  - Summarized results of 2012 field effort and recommended a screening-level ecological risk assessment (SLERA) be conducted
- **SLERA and Low-Threat Closure Evaluation for Site YF3 (2015)**
  - Assessed potential risk to ecological receptors (invertebrates, birds, mammals)
  - Analyzed whether site presents a threat to human health, safety, and the environment according to State Water board's Low-Threat UST Closure Policy
  - Recommended further characterization

# Approach to Further Characterization – Summary



Additional Characterization Requested	Navy's Proposed Approach	Benefit to Risk Assessment and Closure Evaluation
Better definition of contamination extent	<ul style="list-style-type: none"> <li>• Sample surface/subsurface sediment along shore and toward bay</li> <li>• Sample shallow pore water at interface with Bay</li> </ul>	<ul style="list-style-type: none"> <li>• Additional data to bolster CSM</li> <li>• Compare results to screening values to determine whether site poses risk to receptors</li> </ul>
Petroleum fingerprint analysis on sediment and pore water samples	<ul style="list-style-type: none"> <li>• Perform analysis on high and low concentration samples                             <ul style="list-style-type: none"> <li>– High: samples in former AST and fuel lines area</li> <li>– Low: Location TBD based on analytical results</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Increase understanding of weathering and current chemical composition</li> <li>• Additional data to bolster CSM</li> </ul>
TPH testing with/without silica gel cleanup (SGC) to understand contaminant degradation	<ul style="list-style-type: none"> <li>• Conduct paired analyses with/without SGC</li> </ul>	<ul style="list-style-type: none"> <li>• If paired results are different, TPH concentrations will be revisited</li> <li>• If SGC values are lower, TPH values may be lower than currently indicated by standard analytical methods</li> </ul>
Better characterize potential risk to benthic invertebrates	<ul style="list-style-type: none"> <li>• Perform chemical analyses of sediment and pore water</li> <li>• Perform whole sediment toxicity bioassays</li> </ul>	<ul style="list-style-type: none"> <li>• If more shallow sediment and pore water data are compared with screening values, and toxicity test results are used as an additional line of evidence, better estimates of risk to benthic invertebrates can be provided in BERA.</li> </ul>
Site-specific total organic carbon (TOC) data to evaluate contaminant partitioning from sediments	<ul style="list-style-type: none"> <li>• Analyze surface sediment samples for TOC</li> <li>• Calculate Equilibrium Sediment Partitioning Benchmarks (ESB) for volatile organic compounds (VOC) and polycyclic aromatic hydrocarbons (PAH)</li> </ul>	<ul style="list-style-type: none"> <li>• If more ESBs can be calculated, more site-specific risk estimates can be derived</li> </ul>
Estimate site-specific bioaccumulation rather than using literature values	<ul style="list-style-type: none"> <li>• Collect samples</li> <li>• Run 28-day bioaccumulation tests with clam and worm species in same chamber</li> </ul>	<ul style="list-style-type: none"> <li>• Site-specific bioaccumulation data will reduce uncertainty and increase confidence in risk estimates</li> </ul>

# Approach to Further Characterization (1 of 6)



- **Additional Characterization Requested:**

- Additional samples to better define the extent of residual contamination, including at the groundwater discharge/Bay interface.

- **Navy's Proposed Approach:**

- Additional surface/subsurface sediment samples linearly along the shore as well as extending further landward and toward the Bay/Treasure Island.
  - Shallow pore water samples to confirm presence and concentrations of contamination in any potential discharge from the site to the Bay.

- **Benefit to Risk Assessment and Closure Evaluation:**

- Additional samples will bolster the conceptual site model (CSM) and risk assessment.
  - If the concentrations of any contaminants detected in pore water at the sediment/Bay interface, and in surface and subsurface sediment samples located distal to the area of currently identified contamination do not exceed screening values, then the site would not pose risk to receptors nor warrant a removal action.

## Approach to Further Characterization (2 of 6)



- **Additional Characterization Requested:**

- Conduct petroleum fingerprint analysis on one or more each of the sediment and pore water samples.

- **Navy's Proposed Approach:**

- Conduct petroleum fingerprint analysis on samples of sediment and pore water
  - In the area of the former AST and fuel lines (near former sampling location YF3HP021, at surface and 5 ft below ground surface [bgs])
  - In a second location (to be determined), where concentrations appear to be substantially lower

- **Benefit to Risk Assessment and Closure Evaluation:**

- Aid in the understanding of the weathering and current composition of the contamination
- Support a more robust CSM.



## Approach to Further Characterization (3 of 6)



- **Additional Characterization Requested:**

- Conduct TPH testing both with and without silica gel cleanup (SGC) to better understand the nature of the contamination at the site with respect to polar degradation compounds (polars).

- **Navy's Proposed Approach:**

- Conduct paired analyses as requested.

- **Benefit to Risk Assessment and Closure Evaluation:**

- If TPH measurements in samples analyzed after SGC are substantially different from the non-SGC data, the Navy will revisit the estimated TPH concentrations with the Water Board.
  - SGC values which are substantially lower than non-SGC values may indicate actual TPH concentrations are lower than standard analysis without SGC suggests.

## Approach to Further Characterization (4 of 6)



- **Additional Characterization Requested:**

- Better characterize potential risk to benthic invertebrates through
  - Collection of more shallow surface sediment and pore water samples
  - Performing whole sediment bioassays

- **Navy's Proposed Approach:**

- Collect shallow (0-1 ft bgs) sediment and pore water for chemical analyses.
- Collect surface sediment samples for whole sediment toxicity bioassays.

- **Benefit to Risk Assessment and Closure Evaluation:**

- If more shallow sediment and pore water data are compared with screening values, and toxicity test results are used as an additional line of evidence, better estimates of risk to benthic invertebrates can be provided in a BERA.

## Approach to Further Characterization (5 of 6)



- **Additional Characterization Requested:**

- Analyze surface sediment samples for total organic carbon (TOC)
- Use site-specific TOC data to calculate Equilibrium Sediment Partitioning Benchmarks (ESB) for volatile organic compounds (VOC) and polycyclic aromatic hydrocarbons (PAH) (benchmarks are more limited otherwise).

- **Navy's Proposed Approach:**

- Measure TOC in all new surface sediment samples.
- Use the data to calculate ESBs.

- **Benefit to Risk Assessment and Closure Evaluation:**

- If TOC data are available, more ESBs can be calculated for more site-specific risk estimates.

## Approach to Further Characterization (6 of 6)



- **Additional Characterization Requested:**

- Estimate site-specific bioaccumulation rather than using literature values.

- **Navy's Proposed Approach:**

- Collect samples from 0 to 1 ft bgs

- Run 28-day bioaccumulation tests with clam and worm species in same chamber.

- **Benefit to Risk Assessment and Closure Evaluation:**

- If site-specific bioaccumulation data is available, there will be reduced uncertainty and increased confidence in the risk estimates.

# Low Threat Closure Criteria for Site YF3: General Criteria



Criteria	Criterion Met?	Justification
a. Unauthorized release located within service area of a public water system?	Yes	<ul style="list-style-type: none"> <li>San Francisco Public Utilities Commission provides water service to Yerba Buena Island.</li> </ul>
b. Unauthorized release consists only of petroleum?	Yes	<ul style="list-style-type: none"> <li>Former fuel lines and storage tanks are suspected contamination sources.</li> <li>Soil and groundwater data indicate residual concentrations of petroleum-related constituents.</li> </ul>
c. Unauthorized ("primary") release from the UST system has been stopped?	Yes	<ul style="list-style-type: none"> <li>Site no longer in use and potential sources of contamination have been removed or closed in place.</li> </ul>
d. Free product has been removed to the maximum extent practicable?	NA	<ul style="list-style-type: none"> <li>Petroleum sheen observed in temporary wells, however, measureable free product not observed. Negligible potential for LNAPL migration and moreover, recoverability, due to shallow groundwater gradient, long-term flushing in the tidal mixing zone (TMZ), lack of significant quantity of residual LNAPL, salt water intrusion mixing, and absence of a LNAPL hydraulic head.</li> </ul>
e. A conceptual site model (CSM) that assesses the nature, extent, and mobility of the release has been developed?	Yes	<ul style="list-style-type: none"> <li>CSM, including a description of site characteristics, contaminated media, and potential migration, is described in SLERA report.</li> </ul>
f. Secondary source has been removed to the extent practicable?	Yes	<ul style="list-style-type: none"> <li>Site physical constraints make removal of what limited residual contamination that remains technically and fiscally impracticable.</li> </ul>
g. Soil or groundwater has been tested for MTBE and results reported in accordance with H&S Code Section 25296.15?	Yes	<ul style="list-style-type: none"> <li>15 soil samples and 6 groundwater samples analyses were conducted for MTBE. All analytical results were non-detect.</li> </ul>
h. Nuisance as defined by Water Code Section 13050 does not exist at site?	Yes	<ul style="list-style-type: none"> <li>Site contamination does not meet the nuisance criteria because it does not meet all three nuisance requirements (i.e., a nuisance must meet all three).</li> </ul>
Are there unique site attributes or site-specific conditions that demonstrably increase the risk associated with residual petroleum constituents?	NA	<ul style="list-style-type: none"> <li>Little to no current or future anticipated exposure to human and ecological receptors on terrestrial portions of site. Potential risks to ecological receptors in the bay if the contaminated sediments at depth were disturbed in the future.</li> </ul>



# Low Threat Closure Criteria for Site YF3: Media-Specific Criteria



Criteria	Criterion Met?	Justification
<b>1. <u>Groundwater</u> – plume that exceeds water quality criteria must be stable or decreasing in areal extent, and meet all of the additional characteristics of one of 5 site classes (under criteria b below).</b>		
a. Plume stable or decreasing in areal extent?	Yes	<ul style="list-style-type: none"> <li>Contamination appears to be stable and limited in ability to spread vertically and laterally by site geology.</li> </ul>
b. Plume meets all of the additional characteristics of one of 5 site classes?	NA	<ul style="list-style-type: none"> <li>Site does not meet criteria for Classes 1-4. The site may be considered Class 5 since site-specific conditions under current and reasonably anticipated future scenarios pose a low threat to human health and safety, and to the environment.</li> </ul>
c. Sufficient mobile constituents to cause groundwater to exceed criteria?	NA	<ul style="list-style-type: none"> <li>Petroleum hydrocarbons detected in groundwater, however, migration is expected to be minimal.</li> </ul>
<b>2. <u>Petroleum Vapor Intrusion to Indoor Air</u> – Site is considered low-threat if site-specific conditions satisfy one of three classes of sites (a-c), or if the exception for active commercial fueling facility applies.</b>		
Exception: site is active commercial petroleum fueling facility?	Yes	<ul style="list-style-type: none"> <li>Site is no longer active. All former structures and potential contamination sources removed. Future construction of inhabitable buildings within tidal zone unlikely.</li> </ul>
a. Site-specific conditions satisfy characteristics and criteria of scenarios 1-3, or scenario 4 of 1b.	NA	<ul style="list-style-type: none"> <li>There are no existing or anticipated buildings in the area of contamination.</li> </ul>
b. Site-specific risk assessment for the vapor intrusion pathway conducted and demonstrates that human health is protected?	NA	<ul style="list-style-type: none"> <li>No complete human health exposure pathways at the site, nor is there anticipated future development at the site given its location within the tidal zone.</li> </ul>
c. Through use of IC or EC, regulatory agency determines no significant risk to human health.	NA	<ul style="list-style-type: none"> <li>There are no institutional or engineering controls in place, or anticipated to be emplaced, since there is no exposure and risk to humans, nor any structures present.</li> </ul>
<b>3. <u>Direct Contact and Outdoor Air Exposure</u> – Site is considered low-threat if site-specific conditions satisfy one of three classes of sites (a-c).</b>		
a. Maximum concentrations of petroleum constituents in soil less than or equal to those listed in Table 1 for the specified depth bgs.	Yes	<ul style="list-style-type: none"> <li>Benzene, ethylbenzene, naphthalene, and toxicity equivalent (TEQ) for benzo(a)pyrene calculated for waste oil or Bunker C fuel, are all less than Table 1 concentrations.</li> </ul>
b. Petroleum constituents in soil at concentrations less than risk assessment demonstrates will have no significant risk?	Yes	<ul style="list-style-type: none"> <li>Although site soil exceed screening values, there are no complete human health exposure pathways. Therefore, there is no risk posed to human health.</li> </ul>
c. Through mitigation measures or use of IC or EC, regulatory agency determines soils pose no significant risk to human health?	NA	<ul style="list-style-type: none"> <li>There are no institutional or engineering controls in place, or anticipated to be emplaced, since there is no exposure and risk posed to humans.</li> </ul>

# Comparison of Site Data With Low Threat UST Case Closure Policy



**Table 18: Comparison of Site Data with Chemical Concentrations in Table 1 of Low Threat UST Case Closure Policy**

Site YF3 Screening-Level Ecological Risk Assessment, Naval Station Treasure Island, San Francisco, California

Chemical	Concentrations in Soil that Will Have no Significant Risk of Adversely Affecting Human Health (mg/kg) <sup>a</sup>					Maximum Detected Site Concentration 0-5 feet bgs	Maximum Detected Site Concentration 0-10 feet bgs
	Residential		Commercial /Industrial		Utility Worker		
	0 to 5 feet bgs	0 to 10 feet bgs	0 to 5 feet bgs	0 to 10 feet bgs	0 to 10 feet bgs		
Benzene	1.9	2.8	8.2	12	14	ND	ND
Ethylbenzene	21	32	89	134	314	0.02	0.02
Naphthalene	9.7	9.7	45	45	219	0.1	0.1
PAH <sup>b</sup>	0.63	NA	0.68	NA	4.5	0.5	0.5

**Notes:**

a = Concentrations for each chemical are from Table 1 of the Water Board's Low Threat UST Case Closure Policy (State Water Resources Control Board 2012)

b = Based on the seven carcinogenic PAHs as benzo(a)pyrene toxicity equivalent (TEQ) [BaPe]. Sampling and analysis for PAH is only necessary where soil is affected by either waste oil or Bunker C fuel. Although waste oil and Bunker C fuel are not a concern at Site YF3, the PAH concentrations as BaPe have been calculated for comparison.

bgs = below ground surface

mg/kg = milligrams per kilogram

NA = Not applicable

ND= Not detected

PAH = Polycyclic aromatic hydrocarbon

# Field Investigation Challenges



- **Logistical constraints**

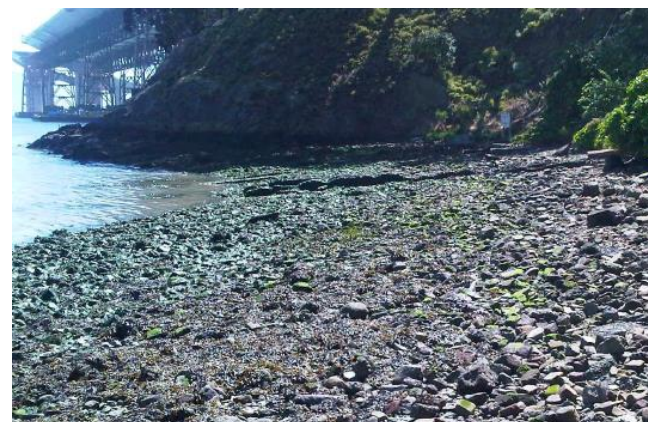
- Tidal cycle provides ~4 effective work hours at a time during ebb tide
- Requires barge for equipment and personnel access/egress
- Must fully mobilize/demobilize per each tidal cycle

- **Safety concerns**

- Mobilization/demobilization activities
- Uneven, algae-covered cobbles a slip/trip/fall hazard

- **Technical considerations**

- Cobbles extend time required for sampling
- Unsuitable environment for installing permanent monitoring points



- **Obtain regulatory agency concurrence with conceptual data gaps sampling outline.**
- **Draft Work Plan in Fall/Winter of 2015**

# Discussion

